WHAT IS CLAIMED IS:

1. A distortion compensating apparatus for compensating for distortion of a transmission power amplifier, comprising:

a memory for storing distortion compensation coefficients, which are for compensating for distortion of the transmission power amplifier, in association with power of a transmit signal;

a predistortion unit for subjecting a transmit signal to distortion compensation processing using a distortion compensation coefficient that conforms to power of the transmit signal;

a DA converter for converting a digital transmit signal, which has been subjected to distortion compensation processing, to an analog signal and inputting the analog signal to the transmission power amplifier;

a distortion compensation coefficient calculation unit for calculating a distortion compensation coefficient based upon a transmit signal before the distortion compensation thereof and a feedback signal fed back from an output side of the transmission power amplifier;

a distortion compensation coefficient correction unit for correcting the distortion compensation coefficient, which has been calculated by said distortion compensation coefficient calculation unit, in such a manner that the transmit signal that has been

subjected to the distortion compensation processing will not exceed a dynamic range of said DA converter; and

a distortion compensation coefficient updating unit for updating a distortion compensation coefficient, which has been stored in said memory, by the distortion compensation coefficient that has been corrected.

2. The apparatus according to claim 1, further comprising a frequency multiplexer for multiplexing digital transmit signals upon digitally subjecting each digital transmit signal to a frequency shift decided by carrier frequency spacing, whereby a frequency-multiplexed signal is obtained;

wherein the frequency-multiplexed signal is input to said predistortion unit and said distortion compensation coefficient calculation unit as a transmit signal x(t).

3. A distortion compensating apparatus having a memory for storing distortion compensation coefficients, which are for compensating for distortion of a transmission power amplifier, in association with power of a transmit signal, a predistortion unit for reading a distortion compensation coefficient $h_n(p)$, which conforms to power of a transmit signal x(t), out of said memory and subjecting the transmit signal to distortion compensation processing using this distortion compensation coefficient, a DA converter for converting a digital transmit signal, which has been subjected to distortion compensation processing, to an analog signal,

a distortion compensation coefficient calculation unit for calculating a distortion compensation coefficient $h_{n+1}(p)$ based upon a transmit signal before the distortion compensation thereof and an output signal of the transmission power amplifier, and a distortion compensation coefficient updating unit for updating a distortion compensation coefficient by storing the calculated distortion compensation coefficient $h_{n+1}(p)$ in said memory in association with the power of the transmit signal x(t), said apparatus comprising:

a comparator for comparing power Pa of a transmit signal, which is output from said predistortion unit by distortion compensation processing that uses the distortion compensation coefficient $h_{n+1}(p)$, and a set upper-limit power Pmax before the distortion compensation coefficient $h_{n+1}(p)$ calculated by said distortion compensation coefficient calculation unit is stored in said memory; and

a distortion compensation coefficient correction unit for correcting the distortion compensation coefficient $h_{n+1}(p)$ in such a manner that power Pa of the transmit signal will fall below that upper-limit power Pmax;

wherein said distortion compensation coefficient updating unit updates a distortion compensation coefficient by storing a corrected distortion compensation coefficient $h_{n+1}(p)'$ in said memory when the power Pa of the transmit signal is greater than the

upper-limit power Pmax.

4. The apparatus according to claim 3, further comprising a frequency multiplexer for multiplexing digital transmit signals upon digitally subjecting each digital transmit signal to a frequency shift decided by carrier frequency spacing, whereby a frequency-multiplexed signal is obtained;

wherein the frequency-multiplexed signal is input to said predistortion unit and said distortion compensation coefficient calculation unit as a transmit signal x(t).

5. The apparatus according to claim 3, wherein if a ratio between the power Pa of the transmit signal that has been subjected to distortion compensation processing and the set upper-limit power Pmax is m^2, said distortion compensation coefficient correction unit outputs the corrected distortion compensation coefficient $h_{n+1}(p)'$ by correcting the distortion compensation coefficient $h_{n+1}(p)$ to $h_{n+1}(p)/m$.

6. The apparatus according to claim 5, wherein said distortion compensation coefficient updating unit updates the distortion compensation coefficient by storing the calculated distortion compensation coefficient $h_{n+1}(p)$ in said memory if the power Pa of the transmit signal is less than the upper-limit power and storing the corrected distortion compensation coefficient $h_{n+1}(p)'$ in said memory if the power Pa of the transmit signal is greater than the upper-limit

power.

7. The apparatus according to claim 3, wherein when said distortion compensation coefficient correction unit corrects a distortion compensation coefficient by subtracting $h_{n+1}(p)/n$ from the calculated distortion compensation coefficient $h_{n+1}(p)$, said distortion compensation coefficient correction unit obtains the smallest integer N that satisfies the following equation:

$$n \leq h_{n+1}(p)/\Delta h_{n+1}(p) \leq 2^N$$

and computes $h_{n+1}(p)/n$ by an N-bit shift operation of the calculated distortion compensation coefficient $h_{n+1}(p)$, where $\Delta h_{n+1}(p)$ is a value that satisfies the following equation:

$$h_{n+1}(p) = h_n(p) + \Delta h_{n+1}(p)$$

8. A distortion compensating apparatus having a memory for storing distortion compensation coefficients, which are for compensating for distortion of a transmission power amplifier, in association with power of a transmit signal, a predistortion unit for subjecting the transmit signal to distortion compensation processing using a distortion compensation coefficient that conforms to power of the transmit signal, a DA converter for converting a digital transmit signal, which has been subjected to distortion compensation processing, to an analog signal and inputting the analog signal to a transmission power amplifier; a distortion compensation coefficient calculation unit for calculating a

distortion compensation coefficient based upon a transmit signal before the distortion compensation thereof and a feedback signal fed back from an output side of the transmission power amplifier, and a distortion compensation coefficient updating unit for updating a distortion compensation coefficient, which has been stored in said memory, by the distortion compensation coefficient that has been caluculated, said apparatus comprising:

a maximum distortion compensation coefficient output unit for outputting a value which is the square of a maximum distortion compensation coefficient $h(p)_{MAX}$ obtained based upon a set upper-limit power Pmax and a transmit signal x(t);

a comparator for comparing the square $|h_{n+1}(p)|^2$ of a distortion compensation coefficient $h_{n+1}(p)$, when the distortion compensation coefficient $h_{n+1}(p)$ has been calculated in said distortion compensation coefficient calculation unit, and the square $|h(p)_{MAX}|^2$ of the maximum distortion compensation coefficient; and

a distortion compensation coefficient correction unit for correcting a distortion compensation coefficient in such a manner that the square of the distortion compensation coefficient will become smaller than the square of the maximum distortion compensation coefficient;

wherein when the square of the distortion compensation coefficient is greater than the square of

the maximum distortion compensation coefficient, said distortion compensation coefficient updating unit updates the distortion compensation coefficient that has been stored in said memory by the corrected distortion compensation coefficient.

9. The apparatus according to claim 8, further comprising a frequency multiplexer for multiplexing digital transmit signals upon digitally subjecting each digital transmit signal to a frequency shift decided by carrier frequency spacing, whereby a frequency-multiplexed signal is obtained;

wherein the frequency-multiplexed signal is input to said predistortion unit and said distortion compensation coefficient calculation unit as a transmit signal x(t).

10. The apparatus according to claim 8, wherein said maximum distortion compensation coefficient output unit has a table for storing the squares of maximum distortion compensation coefficients $h(p)_{MAX}$ in association with power of the transmit signal x(t), and the square of a maximum distortion compensation coefficient $h(p)_{MAX}$ is obtained from said table and is output.

11. The apparatus according to claim 8, wherein if a ratio between power Pa of a transmit signal output from the predistortion unit by distortion compensation processing using the corrected distortion compensation coefficient $h_{n+1}(p)$ and the set upper-limit power Pmax is

m^2, said distortion compensation coefficient correction unit performs the correction by correcting the distortion compensation coefficient $h_{n+1}(p)$ to $h_{n+1}(p)/m$.

12. The apparatus according to claim 8, wherein said distortion compensation coefficient updating unit updates the distortion compensation coefficient by storing the calculated distortion compensation coefficient $h_{n+1}(p)$ in said memory if the square $|h_{n+1}(p)|^2$ of a distortion compensation coefficient is less than the square $|h(p)_{MAX}|^2$ of the maximum distortion compensation coefficient and storing the corrected distortion compensation coefficient $h_{n+1}(p)'$ [$= h_{n+1}(p)/m$] in said memory if the square of the distortion compensation coefficient is greater than the square of the maximum distortion compensation coefficient.

13. The apparatus according to claim 8, wherein when said distortion compensation coefficient correction unit corrects a distortion compensation coefficient by subtracting $h_{n+1}(p)/n$ from the calculated distortion compensation coefficient $h_{n+1}(p)$, said distortion compensation coefficient correction unit obtains the smallest integer N that satisfies the following equation:

$$n \leq h_{n+1}(p)/\Delta h_{n+1}(p) \leq 2^N$$

and computes $h_{n+1}(p)/n$ by an N-bit shift operation of the calculated distortion compensation coefficient $h_{n+1}(p)$, where $\Delta h_{n+1}(p)$ is a value that satisfies the following equation:

$$h_{n+1}(p) = h_n(p) + \Delta h_{n+1}(p)$$

14. A distortion compensating apparatus for compensating for distortion of a transmission power amplifier, comprising:

a memory for storing distortion compensation coefficients, which are for compensating for distortion of the transmission power amplifier, in association with power of a transmit signal x(t);

a predistortion unit for subjecting a transmit signal x(t) to distortion compensation processing using a distortion compensation coefficient that conforms to power of the transmit signal;

a DA converter for converting a digital transmit signal, which has been subjected to distortion compensation processing, to an analog signal and inputting the analog signal to the transmission power amplifier;

a distortion compensation coefficient calculation unit for calculating a distortion compensation coefficient $h_{n+1}(p)$ based upon a transmit signal x(t) before the distortion compensation thereof and a feedback signal fed back from an output side of the transmission power amplifier; and

a table for storing, in advance in association with combinations of $|x(t)|^2$ and $h_{n+1}(p)$, distortion compensation coefficients $h_{n+1}(p)$` obtained by correcting the distortion compensation coefficient $h_{n+1}(p)$ in such a manner that power Pa of a transmit signal, which has

been obtained by subjecting a transmit signal x(t) to distortion compensation processing using a distortion compensation coefficient $h_{n+1}(p)$ will become smaller than a set upper-limit power Pmax, and for storing as is in advance, in association with combinations of $|x(t)|^2$ and $h_{n+1}(p)$, distortion compensation coefficients $h_{n+1}(p)$ when the power Pa of the transmit signal that has been subjected to distortion compensation is less than the upper-limit power Pmax; and

a distortion compensation coefficient updating unit which, when a distortion compensation coefficient has been calculated by said distortion compensation coefficient calculation unit, is for obtaining, from said table, a distortion compensation coefficient $h_{n+1}(p)`$ that conforms to a combination of the calculated distortion compensation coefficient $h_{n+1}(p)$ and the power $|x(t)|^2$ of the transmit signal x(t), and storing this distortion compensation coefficient $h_{n+1}(p)`$ in said memory.

15. The apparatus according to claim 14, further comprising a frequency multiplexer for multiplexing digital transmit signals upon digitally subjecting each digital transmit signal to a frequency shift decided by carrier frequency spacing, whereby a frequency-multiplexed signal is obtained;

wherein the frequency-multiplexed signal is input to said predistortion unit and said distortion compensation coefficient calculation unit as a transmit

signal x(t).

16. A distortion compensating apparatus for compensating for distortion of a transmission power amplifier, comprising:

a memory for storing distortion compensation coefficients $h_n(p)$, which are for compensating for distortion of the transmission power amplifier, in association with power of a transmit signal;

a predistortion unit for subjecting a transmit signal x(t) to distortion compensation processing using a distortion compensation coefficient that conforms to power of the transmit signal;

a distortion compensation coefficient calculation unit for calculating a distortion compensation coefficient based upon a transmit signal x(t) before the distortion compensation thereof and a feedback signal fed back from an output side of the transmission power amplifier;

a distortion compensation coefficient updating unit for updating a distortion compensation coefficient, which has been stored in said memory, by the distortion compensation coefficient that has been corrected; and

a table for storing, in advance in association with combinations of $|x(t)|^2$ and $h_n(p)$, distortion compensation coefficients $h_n(p)'$ obtained by correcting the distortion compensation coefficient $h_n(p)$ in such a manner that power Pa of a transmit signal, which has been obtained by subjecting a transmit signal x(t) to

distortion compensation processing using a distortion compensation coefficient $h_n(p)$ will become smaller than a set upper-limit power Pmax, and for storing as is in advance, in association with combinations of $|x(t)|^2$ and $h_n(p)$, distortion compensation coefficients $h_n(p)$ when the power Pa of the transmit signal that has been subjected to distortion compensation is less than the upper-limit power Pmax;

wherein a distortion compensation coefficient $h_n(p)$ that conforms to power $|x(t)|^2$ of transmit signal x(t) is read out of said memory, a distortion compensation coefficient $h_n(p)$ that conforms to a combination of $|x(t)|^2$ and $h_n(p)$ is read out of said table and this distortion compensation coefficient is input to said predistortion unit.

17. The apparatus according to claim 16, further comprising a frequency multiplexer for multiplexing digital transmit signals upon digitally subjecting each digital transmit signal to a frequency shift decided by carrier frequency spacing, whereby a frequency-multiplexed signal is obtained;

wherein the frequency-multiplexed signal is input to said predistortion unit and said distortion compensation coefficient calculation unit as a transmit signal x(t).

18. A distortion compensating apparatus for compensating for distortion of a transmission power amplifier, comprising:

a memory for storing distortion compensation coefficients, which are for compensating for distortion of the transmission power amplifier, in association with power of a transmit signal;

an error signal generator for reading a distortion compensation coefficient that conforms to power of a transmit signal out of said memory, subjecting the transmit signal to distortion compensation processing using this distortion compensation coefficient and outputting an error signal, which is the difference between a transmit signal obtained by being subjected to distortion compensation processing and a transmit signal before the distortion compensation processing thereof;

a DA converter for converting the error signal to an analog signal and outputting the analog error signal;

a combiner for adding the output of said DA converter to an analog transmit signal and inputting the resultant signal to the transmission power amplifier;

a distortion compensation coefficient calculation unit for calculating a distortion compensation coefficient based upon a transmit signal before the distortion compensation thereof and an output signal of the transmission power amplifier;

a distortion compensation coefficient correction unit for correcting a distortion compensation coefficient, which has been caluculated by said distortion compensation coefficient calculation unit, in such a manner that the error signal will not exceed a

dynamic range of said DA converter; and

a distortion compensation coefficient updating unit for updating a distortion compensation coefficient by storing the corrected distortion compensation coefficient in said memory in association with power of a transmit signal.

19. The apparatus according to claim 18, further comprising:

a first frequency multiplexer for multiplexing digital transmit signals upon digitally subjecting each digital transmit signal to a frequency shift decided by carrier frequency spacing, whereby a frequency-multiplexed signal is obtained;

means for inputting the frequency-multiplexed signal to said error signal generator and said distortion compensation coefficient calculation unit as a transmit signal x(t); and

a second frequency multiplexer for converting the digital transmit signals to analog transmit baseband signals, multiplexing the transmit baseband signals upon digitally subjecting each baseband signal to a frequency shift decided by carrier frequency spacing whereby a frequency-multiplexed signal is obtained, and inputting the frequency-multiplexed signal to said combiner as an analog transmit signal x(t).

20. The apparatus according to claim 18, further comprising:

frequency shifting means for digitally subjecting

digital transmit signals to a frequency shift decided by carrier frequency spacing, whereby frequency-shifted signals are obtained;

a first frequency multiplexer for multiplexing the frequency-shifted signals;

means for inputting the frequency-multiplexed signal to said error signal generator and said distortion compensation coefficient calculation unit as a transmit signal x(t);

a second frequency multiplexing unit for converting the frequency-shifted signals to analog signals and combining the analog signals thus obtained, whereby an analog frequency-multiplexed signal is obtained; and

means for inputting the analog frequency-multiplexed signal, which is output from said second frequency multiplexer, to said combiner as an analog transmit signal x(t).

21. A distortion compensating apparatus having a memory for storing distortion compensation coefficients, which are for compensating for distortion of a transmission power amplifier, in association with power of a transmit signal, an error signal generator for reading a distortion compensation coefficient that conforms to power of a transmit signal out of said memory, subjecting the transmit signal to distortion compensation processing using this distortion compensation coefficient and outputting an error signal, which is the difference between a transmit signal

obtained by being subjected to distortion compensation processing and a transmit signal before the distortion compensation processing thereof, a DA converter for converting the error signal to an analog signal and outputting the analog error signal, a combiner for adding the output of said DA converter to an analog transmit signal and inputting the resultant signal to the transmission power amplifier, a distortion compensation coefficient calculation unit for calculating a distortion compensation coefficient based upon a transmit signal before the distortion compensation thereof and an output signal of the transmission power amplifier, and a distortion compensation coefficient updating unit for updating a distortion compensation coefficient by storing the calculated distortion compensation coefficient in said memory in association with power of a transmit signal, said apparatus comprising:

a comparator for comparing the square $|h_{n+1}(p)|^2$ of a distortion compensation coefficient $h_{n+1}(p)$ and the square $|h(p)_{MAX}|^2$ of a set maximum distortion compensation coefficient before the distortion compensation coefficient $h_{n+1}(p)$, which has been calculated by said distortion compensation coefficient calculation unit, is stored in said memory; and

a distortion compensation coefficient correction unit for correcting the distortion compensation coefficient $h_{n+1}(p)$ when $|h_{n+1}(p)|^2$ is greater than

$|h(p)_{MAX}|^2$;

wherein said distortion compensation coefficient updating unit updates the distortion compensation coefficient by storing the calculated distortion compensation coefficient $h_{n+1}(p)$ in said memory if $|h_{n+1}(p)|^2$ is less than the square $|h(p)_{MAX}|^2$ and storing the corrected distortion compensation coefficient in said memory if $|h_{n+1}(p)|^2$ is greater than $|h(p)_{MAX}|^2$.

22. The apparatus according to claim 21, wherein if a ratio between $|h_{n+1}(p)|^2$ and $|h(p)_{MAX}|^2$ is m^2, said distortion compensation coefficient correction unit outputs a corrected distortion compensation coefficient $h_{n+1}(p)'$ by correcting the distortion compensation coefficient $h_{n+1}(p)$ to $h_{n+1}(p)/m$.

23. The apparatus according to claim 21, further comprising:

a first frequency multiplexer for multiplexing digital transmit signals upon digitally subjecting each digital transmit signal to a frequency shift decided by carrier frequency spacing, whereby a frequency-multiplexed signal is obtained;

means for inputting the frequency-multiplexed signal to said error signal generator and distortion compensation coefficient calculation unit as a transmit signal x(t); and

a second frequency multiplexer for converting the digital transmit signals to analog transmit baseband signals, multiplexing the transmit baseband signals upon

digitally subjecting each baseband signal to a frequency shift decided by carrier frequency spacing, whereby a frequency-multiplexed signal is obtained and inputting the frequency-multiplexed signal to said combiner as an analog transmit signal x(t).

24. The apparatus according to claim 21, further comprising:

frequency shifting means for digitally subjecting digital transmit signals to a frequency shift decided by carrier frequency spacing, whereby frequency-shifted signals are obtained;

a first frequency multiplexer for multiplexing the frequency-shifted signals;

means for inputting the frequency-multiplexed signal to said error signal generator and said distortion compensation coefficient calculation unit as a transmit signal x(t);

a second frequency multiplexing unit for converting the frequency-shifted signals to analog signals and combining the analog signals thus obtained, whereby an analog frequency-multiplexed signal is obtained; and

means for inputting the analog frequency-multiplexed signal, which is output from said second frequency multiplexer, to said combiner as an analog transmit signal x(t).

25. A distortion compensating apparatus for compensating for distortion of a transmission power amplifier, comprising:

a memory for storing distortion compensation coefficients, which are for compensating for distortion of the transmission power amplifier, in association with power of a transmit signal;

an error signal generator for reading a distortion compensation coefficient that conforms to power of a transmit signal out of said memory, subjecting the transmit signal to distortion compensation processing using this distortion compensation coefficient and outputting an error signal, which is the difference between a transmit signal obtained by being subjected to distortion compensation processing and a transmit signal before the distortion compensation processing thereof;

a DA converter for converting the error signal to an analog signal and outputting the analog error signal;

a combiner for adding the output of said DA converter to an analog transmit signal and inputting the resultant signal to the transmission power amplifier;

a distortion compensation coefficient calculation unit for calculating a distortion compensation coefficient based upon a transmit signal before the distortion compensation thereof and an output signal of the transmission power amplifier;

a table for storing, in association with a distortion compensation coefficient $h_{n+1}(p)$ that has been calculated by said distortion compensation coefficient unit, a distortion compensation coefficient $h_{n+1}(p)'$ that has been corrected beforehand in such a manner that the

square of the distortion compensation coefficient $h_{n+1}(p)$ will become smaller than the square $|h(p)_{MAX}|^2$ of a set maximum distortion compensation coefficient; and

a distortion compensation coefficient updating unit which, when a distortion compensation coefficient has been calculated by said distortion compensation coefficient calculation unit, is for obtaining, from said table, the corrected value $h_{n+1}(p)'$ of the distortion compensation coefficient that conforms to the calculated distortion compensation coefficient $h_{n+1}(p)$, and storing this distortion compensation coefficient $h_{n+1}(p)'$ in said memory, thereby updating the distortion compensation coefficient.

26. The apparatus according to claim 25, further comprising:

a first frequency multiplexer for multiplexing digital transmit signals upon digitally subjecting each digital transmit signal to a frequency shift decided by carrier frequency spacing, whereby a frequency-multiplexed signal is obtained;

means for inputting the frequency-multiplexed signal to said error signal generator and said distortion compensation coefficient calculation unit as a transmit signal x(t); and

a second frequency multiplexer for converting the digital transmit signals to analog transmit baseband signals, multiplexing the transmit baseband signals by digitally subjecting each baseband signal to a frequency

shift decided by carrier frequency spacing, whereby a frequency-multiplexed signal is obtained and inputting the frequency-multiplexed signal to said combiner as an analog transmit signal x(t).

27. The apparatus according to claim 25, further comprising:

frequency shifting means for digitally subjecting digital transmit signals to a frequency shift decided by carrier frequency spacing, whereby frequency-shifted signals are obtained;

a first frequency multiplexer for multiplexing the frequency-shifted signals;

means for inputting the frequency-multiplexed signal to said error signal generator and said distortion compensation coefficient calculation unit as a transmit signal x(t);

a second frequency multiplexing unit for converting the frequency-shifted signals to analog signals and combining the analog signals thus obtained, whereby an analog frequency-multiplexed signal is obtained; and

means for inputting the analog frequency-multiplexed signal, which is output from said second frequency multiplexer, to said combiner as an analog transmit signal x(t).

28. A distortion compensating apparatus for compensating for distortion of a transmission power amplifier, comprising:

a memory for storing distortion compensation

coefficients, which are for compensating for distortion of the transmission power amplifier, in association with power of a transmit signal;

an error signal generator for reading a distortion compensation coefficient that conforms to power of a transmit signal out of said memory, subjecting the transmit signal to distortion compensation processing using this distortion compensation coefficient and outputting an error signal, which is the difference between a transmit signal obtained by being subjected to distortion compensation processing and a transmit signal before the distortion compensation processing thereof;

a DA converter for converting the error signal to an analog signal and outputting the analog error signal;

a combiner for adding the output of said DA converter to an analog transmit signal and inputting the resultant signal to the transmission power amplifier;

a distortion compensation coefficient calculation unit for calculating a distortion compensation coefficient based upon a transmit signal before the distortion compensation thereof and an output signal of the transmission power amplifier;

a distortion compensation coefficient updating unit for updating a distortion compensation coefficient by storing the calculated distortion compensation coefficient in said memory in association with power of a transmit signal; and

a table for storing, in association with a

distortion compensation coefficient $h_n(p)$ that has been calculated by said distortion compensation coefficient unit, a distortion compensation coefficient $h_n(p)'$ that has been corrected in such a manner that the square of the distortion compensation coefficient $h_n(p)$ will become smaller than the square $|h(p)_{MAX}|^2$ of a set maximum distortion compensation coefficient;

wherein a distortion compensation coefficient $h_n(p)$ that conforms to power $|x(t)|^2$ of transmit signal $x(t)$ is read out of said memory, the distortion compensation coefficient $h_n(p)'$ that conforms to the distortion compensation coefficient $h_n(p)$ is read out of said table and this distortion compensation coefficient is input to said error signal generator.

29. The apparatus according to claim 28, further comprising:

a first frequency multiplexer for multiplexing digital transmit signals upon digitally subjecting each digital transmit signal to a frequency shift decided by carrier frequency spacing, whereby a frequency-multiplexed signal is obtained;

means for inputting the frequency-multiplexed signal to said error signal generator and said distortion compensation coefficient calculation unit as a transmit signal $x(t)$; and

a second frequency multiplexer for converting the digital transmit signals to analog transmit baseband signals and multiplexing the transmit baseband signals

upon digitally subjecting each baseband signal to a frequency shift decided by carrier frequency spacing, whereby a frequency-multiplexed signal is obtained and inputting the frequency-multiplexed signal to said combiner as an analog transmit signal x(t).

30. The apparatus according to claim 28, further comprising:

frequency shifting means for digitally subjecting digital transmit signals to a frequency shift decided by carrier frequency spacing, whereby frequency-shifted signals are obtained, whereby a frequency-multiplexed signal is obtained and inputting the frequency-multiplexed signal to said combiner as an analog transmit singal x(t).

a first frequency multiplexer for multiplexing the frequency-shifted signals;

means for inputting the frequency-multiplexed signal to said error signal generator and said distortion compensation coefficient calculation unit as a transmit signal x(t);

a second frequency multiplexing unit for converting the frequency-shifted signals to analog signals and combining the analog signals thus obtained, whereby an analog frequency-multiplexed signal is obtained; and

means for inputting the analog frequency-multiplexed signal, which is output from said second frequency multiplexer, to said combiner as an analog transmit signal x(t).

31. A distortion compensating apparatus for compensating for distortion of a transmission power amplifier, comprising:

a memory for storing distortion compensation coefficients, which are for compensating for distortion of the transmission power amplifier, in association with power of a transmit signal;

a predistortion unit for subjecting a transmit signal to distortion compensation processing using a distortion compensation coefficient that conforms to power of the transmit signal, and inputting the resultant signal to the transmission power amplifier;

a distortion compensation coefficient calculation unit for calculating a distortion compensation coefficient based upon a difference between a transmit signal before the distortion compensation thereof and a feedback signal fed back from an output side of the transmission power amplifier, and updating a distortion compensation coefficient, which has been stored in said memory, by the distortion compensation coefficient that has been calculated; and

an amplitude controller for controlling amplitude of the feedback signal based upon amplitude or power of the transmit signal before the distortion compensation thereof.

32. A distortion compensating apparatus for compensating for distortion of a transmission power amplifier, comprising:

a memory for storing distortion compensation coefficients, which are for compensating for distortion of the transmission power amplifier, in association with power of a transmit signal;

a predistortion unit for subjecting a transmit signal to distortion compensation processing using a distortion compensation coefficient that conforms to power of the transmit signal, and inputting the resultant signal to the transmission power amplifier;

a distortion compensation coefficient calculation unit for calculating a distortion compensation coefficient based upon a difference between a transmit signal before the distortion compensation thereof and a feedback signal fed back from an output side of the transmission power amplifier, and updating a distortion compensation coefficient, which has been stored in said memory, by the distortion compensation coefficient that has been calculated;

a limit-level surpass detector for detecting whether the transmit signal that has been subjected to the distortion compensation processing has surpassed a limit level; and

an amplitude controller for controlling the amplitude of the feedback signal when the limit level has been surpassed.

33. The apparatus according to claim 32, wherein said amplitude controller controls the amplitude of the feedback signal based upon the amplitude or power of the

transmit signal before the distortion compensation thereof.

34. The apparatus according to claim 32, further comprising means for comparing the transmit signal that has been subjected to distortion compensation processing and a signal, which is obtained by multiplying the transmit signal before the distortion compensation thereof by k, and instructing said amplitude controller to start control of the amplitude of the feedback signal if the former is greater than the latter when the limit level has been surpassed;

wherein said amplitude controller responds to the instruction to start amplitude control by controlling the amplitude of the feedback signal.

35. The apparatus according to claim 32, further comprising means for comparing a signal, which is obtained by multiplying the transmit signal before the distortion compensation thereof by k, and the transmit signal that has been subjected to distortion compensation processing, instructing said amplitude controller to start control of the amplitude of the feedback signal if the former is greater than the latter when the limit level has been surpassed, and instructing said distortion compensation coefficient calculation unit to halt updating of the distortion compensation coefficient if the difference between the former and the latter has exceeded a threshold value;

wherein said amplitude controller responds to the

instruction to start amplitude control by controlling the amplitude of the feedback signal, and said distortion compensation coefficient calculation unit responds to the instruction to halt updating of the distortion compensation coefficient by halting calculation of the distortion compensation coefficient.

36. The apparatus according to claim 32, further comprising means for comparing the transmit signal that has been subjected to distortion compensation processing and a signal, which is obtained by multiplying the transmit signal before the distortion compensation thereof by k, instructing said amplitude controller to start control of the amplitude of the feedback signal if the former is greater than the latter when the limit level has been surpassed, and inputting the difference between the former and the latter to said distortion compensation coefficient calculation unit;

wherein said amplitude controller responds to the instruction to start amplitude control by controlling the amplitude of the feedback signal, and said distortion compensation coefficient calculation unit changes a parameter value, which is used in calculation of the distortion compensation coefficient, based upon said difference.

37. The apparatus according to claim 32, further comprising a DA converter for converting a digital transmit signal that has been subjected to distortion compensation processing to an analog signal and

inputting the analog signal to the transmission power amplifier;

wherein said predistortion unit multiplies a digital transmit signal before the distortion compensation by a digital distortion compensation coefficient to thereby subject the transmit signal to distortion compensation processing, and said DA converter converts an output from said predistortion unit to an analog signal and outputs this analog signal.

38. The apparatus according to claim 31, wherein said predistortion unit includes:

an error signal generator for reading a distortion compensation coefficient that conforms to power of a transmit signal out of said memory, subjecting the transmit signal to distortion compensation processing using this distortion compensation coefficient and outputting an error signal, which is the difference between a transmit signal obtained by being subjected to distortion compensation processing and a transmit signal before the distortion compensation processing thereof;

a DA converter for converting the error signal to an analog signal and outputting the analog error signal; and

a combiner for adding the output of said DA converter to an analog transmit signal and inputting the resultant signal to the transmission power amplifier.

39. The apparatus according to claim 31, further comprising a frequency multiplexer for multiplexing

digital transmit signals upon digitally subjecting each digital transmit signal to a frequency shift decided by carrier frequency spacing, whereby a frequency-multiplexed signal is obtained;

wherein the frequency-multiplexed signal is input to said error signal generator and distortion compensation coefficient calculation unit as a transmit signal.

40. The apparatus according to claim 38, further comprising:

a first frequency multiplexer for multiplexing digital transmit signals upon digitally subjecting each digital transmit signal to a frequency shift decided by carrier frequency spacing, whereby a frequency-multiplexed signal is obtained, and adopting the frequency-multiplexed signal as a digital transmit signal; and

a second frequency multiplexer for converting the frequency-shifted signals to analog signals, multiplexing the analog signals and adopting the frequency-multiplexed signal as an analog transmit signal;

wherein said error signal generator generates the error signal based upon the frequency-multiplexed digital transmit signal, said DA converter converts the error signal to an analog signal, and said combiner combines the output of said DA converter and the analog transmit signal and inputs the resultant signal to the

transmission power amplifier.